

Extract



November 15, 2011 Nuclear and Industrial Safety Agency

#### Seismic Damage Information (the 296th Release)

(As of 14:00 November 15, 2011)

The Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa Nuclear Power Station (NPS), Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows:

1. Nuclear Power Stations (NPSs)

- Fukushima Dai-ichi NPS (TEPCO)
  - Hydrazine (about 2 m<sup>3</sup>) was injected into the spent fuel pool at Unit 2 from the alternative cooling system for the spent fuel pool (from 13:29 to 15:14, November 14).
  - The accumulated water in the basement of the turbine building of Unit 3 was transferred to the building of miscellaneous solid waste volume reduction facilities (from 09:25, November 15).
  - Due to clean-up work at the seawater pump room of Unit 6,
    - the RHR (A) pump of Unit 6 was suspended and the reactor cooling was suspended (from 06:44, November 15).
    - the ASW (A) pump of Unit 6 was suspended and the spent fuel pool cooling was suspended (from 06:47, November 15).
    - the emergency DGSW (B) pump of Unit 6 was suspended and the D/G
      (A) was shifted to out-of-service (from 6:50, November 15).
  - The circulating seawater decontamination system was suspended for maintenance (from 08:44, November 12 to 10:13, November 14).
  - The decontaminated accumulated water of Units 5 and 6 was sprayed on the premises (<u>from 08:57 to 11:00, November 15</u>).
  - Due to installation work of the flow rate control valve at the emergency reactor water injection line of Units 1 to 3, the D/G for the emergency high-ground reactor water injection pump was shifted to out-of-service (from 09:30 to 10:37, November 15).

<Instructions on Food and Drink>

- Addition of restriction on shipment
  - On November 14, shiitake produced in Kawamata Village, Fukushima Prefecture (limited to those grown on raw lumber in facilities)
  - On November 14, nameko produced in Nikko City and Nasushiobara City, Tochigi Prefecture (limited to those grown on raw lumber at the open-field)
  - On November 14, kuritake produced in Ashikaga City, Sano City, Mooka City, Sakura City, Nasukarasuyama City, Kaminokawa Town, Motegi Town, Haga Town, and Takanezawa Town in Tochigi Prefecture (limited to those grown on raw lumber at the open-field)

For more information: NISA English Home Page http://www.nisa.meti.go.jp/english/index.html



Extract



November 16, 2011 Nuclear and Industrial Safety Agency

#### Seismic Damage Information (the 297th Release)

(As of 14:00 November 16, 2011)

The Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa Nuclear Power Station (NPS), Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows:

1. Nuclear Power Stations (NPSs)

- Fukushima Dai-ichi NPS (TEPCO)
  - The flow rate control valve at the emergency reactor water injection line of Unit 3 was additionally installed (from 09:33 to 11:41, November 16).
  - Due to clean-up work at the seawater pump room of Unit 6, the RHR (A) pump of Unit 6 was suspended and the reactor cooling was suspended (from 06:44 to <u>17:22</u>, November 15 <u>and from 06:37</u>, <u>November 16</u>), and the ASW (A) pump of Unit 6 was suspended and the spent fuel pool cooling was suspended (from 06:47 to <u>16:58</u>, November 15 <u>and from 06:41</u>, <u>November 16</u>).
  - The decontaminated accumulated water of Units 5 and 6 was sprayed on the premises (from 09:20 to 11:20, November 16).

<Temporary Access to Restricted Areas>

- Residents were allowed temporary access in the following town:
- 2) Second round (by private car)

Okuma Town (on November 16)

<Instructions on Food and Drink>

- Addition of restriction on shipment

- Kiwifruit (Minamisoma City)
- Wasabi (Date City)

For more information: NISA English Home Page http://www.nisa.meti.go.jp/english/index.html



Extract



November 17, 2011 Nuclear and Industrial Safety Agency

#### Seismic Damage Information (the 298<sup>th</sup> Release) (As of 12:00 November 17, 2011)

The Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa Nuclear Power Station (NPS), Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows:

- 1. Nuclear Power Stations (NPSs)
  - Fukushima Dai-ichi NPS (TEPCO)
    - Fresh water was injected into the spent fuel pool of Unit 3 in order to fill the skimmer surge tank with water (from 16:03 to 16:47, November 16).
    - Due to clean-up work at the seawater pump room of Unit 6, the RHR (A) pump of Unit 6 was suspended and the reactor cooling was suspended (from 06:37 to <u>17:06</u>, November 16 and from 06:36, November 17). The ASW (A) pump of Unit 6 was suspended and the spent fuel pool cooling was suspended (from 06:41 to <u>16:49</u>, November 16 and from 06:39, November <u>17</u>).
    - The accumulated water in the basement of the turbine building of Unit 6 was transferred to a temporary tank (from 10:00, November 17).
    - The decontaminated accumulated water of Units 5 and 6 was sprayed on the premises (from 09:03 to 10:38, November 17).

< Actions taken by NISA and other organizations>

- At the request from the Chairman of the Special Committee on Science, Technology, and Innovation Promotion, the House of Representatives, to the Minister of Economy, Trade and Industry regarding the submission of materials to the Special Committee on Science, Technology and Innovation Promotion, which are required for verifying the causes of the accident at Fukushima Dai-ichi NPS of TEPCO (dated September 12), part of the requested materials, which had not yet been responded, was submitted to the Special Committee on November 16. <Temporary Access to Restricted Areas>

- Residents were allowed temporary access in the following town:

2) Second round (by private car)

Futaba Town (on November 17)

For more information: NISA English Home Page http://www.nisa.meti.go.jp/english/index.html



Extract



November 18, 2011 Nuclear and Industrial Safety Agency

#### Seismic Damage Information (the 299<sup>th</sup> Release) (As of 09:00 November 18, 2011)

The Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa Nuclear Power Station (NPS), Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows:

- 1. Nuclear Power Stations (NPSs)
  - Fukushima Dai-ichi NPS (TEPCO)
    - The additional installation work of the flow rate control valve at the emergency reactor water injection line of Unit 1 was implemented (from 09:15 to 13:09, November 17). Then, the leakage test was conducted (from 13:09 to 15:36, November 17).
    - The additional installation work of the flow rate control valve at the emergency reactor water injection line of Unit 2 was implemented (from 09:15 to 13:09, November 17). Then, the leakage test was conducted (from 13:09 to 15:36, November 17).
    - The alternative cooling system for spent fuel pool of Unit 3 was suspended due to cleaning of the strainer at the primary line (from 13:32 to 14:55, November 17).
    - Hydrazine was injected into the spent fuel pool at Unit 4 via the alternative cooling system for the spent fuel pool (from 13:15 to 14:50, November 17).
    - A leakage alarm went off at the thermal exchange unit of the alternate cooling system for the spent fuel pool of Unit 4, and the unit shut off automatically (at 14:58, November 17). Since no abnormal event such as leakage was identified as a result of on-site inspection, the unit was restarted (at 16:12 on the same day). Subsequently, the flow rate was adjusted to the normal level (at 16:27 on the same day). The cause of the alarm is estimated to be a temporary malfunction of the flow rate controller, as the unit is operating normally at the normal flow rate.
    - Due to clean-up work at the seawater pump room of Unit 6, the RHR (A)

pump of Unit 6 was suspended and the reactor cooling was suspended (from 06:36 to 17:02, November 17 and from 06:37, November 18). The ASW (A) pump of Unit 6 was suspended and the spent fuel pool cooling was suspended (from 06:39 to 16:47, November 17 and from 06:40, November 18).

- The accumulated water in the basement of the turbine building of Unit 6 was transferred to a temporary tank (from 10:00 to 16:00, November 17).
- The decontaminated accumulated water of Units 5 and 6 was sprayed on the premises (<u>from 09:00, November 18</u>).
- Water leakage was found at three pinholes present in the concentrated water transfer line and one pinhole in the fresh water transfer line of the desalination device (a reverse osmosis membrane type) (around 10:50, November 17). The leakage at the fresh water transfer line was stopped by fixing the pinhole with waterproof tape. Since the concentrated water transfer line was isolated, it is estimated that the leakage was caused by the accumulated water inside the hose of the line when the hose was lifted up in some work. It has been confirmed that the leakage was stopped when the hose was placed back in the original position (around 14:30 on the same day). The amount of leakage identified on the asphalt is about 25 liters, and no difference has been detected in the atmospheric dose between the area around the leakages and the surrounding areas.
- Fukushima Dai-ni NPS (TEPCO)
  - The RHR (A) of Unit 1, which had been inoperable since affected by tsunami, was shifted to standby mode after its integrity was confirmed by a trial run (at 15:35, November 17).
  - The RHR (B) pump was suspended in order to switch from RHR (B) to RHR (A) of Unit 1 (at 17:15, November 17). Then, the RHR (A) pump was started up (at 17:29 of the same day).
  - The D/G (H) was shifted to out-of-service due to the inspection on the power distribution board (from 10:27, November 14 to <u>15:03</u>, <u>November 17</u>).

<Actions taken by NISA and other organizations>

The "Roadmap towards Restoration from the Accident at Fukushima Dai-ichi Nuclear Power Station, TEPCO" and "Roadmap for Immediate Actions for the Assistance of Residents Affected by the Nuclear Incident" were formulated as action plans for the immediate issues regarding responses to the residents and local governments affected by the nuclear accident.

On November 17, the Nuclear Emergency Response Headquarters announced the revised versions, explaining the progress status of the actions thus far.

<Instructions on Food and Drink>

- Addition of restriction on shipment
  - On November 17, rice produced in Fukushima City, Fukushima Prefecture (limited to the former Oguni village area)

For more information: NISA English Home Page http://www.nisa.meti.go.jp/english/index.html



Extract



November 21, 2011 Nuclear and Industrial Safety Agency

#### Seismic Damage Information (the 300th Release)

(As of 12:00 November 21, 2011)

The Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa Nuclear Power Station (NPS), Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows:

1. Nuclear Power Stations (NPSs)

- Fukushima Dai-ichi NPS (TEPCO)
  - The water injection rate into the reactor of Unit 1 was adjusted from 7.55m<sup>3</sup>/h to 5.5 m<sup>3</sup>/h (at 15:33, November 18).
  - Water leakage was found at the connection of the pressure hose at the suction side of the emergency high-ground reactor water injection pump for Unit 1 (at 16:10, November 18). A pan was placed as a measure to receive the leaking water.
  - The water injection rate into the reactor of Unit 1 was adjusted to  $5.5m^{3/h}$  due to the decrease in the rate to  $5.3m^{3/h}$  (at 13:58, November 20).
  - The water injection rate into the reactor of Unit 2 was adjusted to  $3.1 \text{m}^3/\text{h}$  via the feedwater line and to  $7.1 \text{m}^3/\text{h}$  via the core spray line (at 15:33, November 18).
  - The water injection rate into the reactor of Unit 3 was adjusted to  $2.5 \text{m}^3/\text{h}$  via the feedwater line and to  $8.1 \text{m}^3/\text{h}$  via the core spray line (at 15:33, November 18).
  - Due to the clogging found at the filter of the spray tank at the secondary cooling tower for the spent fuel pool of Unit 3, the secondary cooling tower was switched from line A to line B (from 16:11 to 16:50, November 19).
  - The accumulated water in the condensate storage tank of Unit 3 was transferred to the turbine building of Unit 3 (<u>from 10:22, November 21</u>).
  - Due to clean-up work at the seawater pump room of Unit 6,
    - The RHR (A) pump of Unit 6 was suspended and the reactor cooling was

suspended (from 06:37 to <u>17:09</u>, <u>November 18</u>, from 06:41 to <u>17:28</u>, <u>November 19</u>, and from 06:32, <u>November 21</u>)

- The ASW (A) pump of Unit 6 was suspended and the spent fuel pool cooling was suspended (from 06:40 to <u>16:51</u>, <u>November 18</u>, from 06:43 to <u>17:14</u>, <u>November 19</u>, and from 06:34, <u>November 21</u>).
- The accumulated water in the basement of the turbine building of Unit 6 was transferred to a temporary tank (<u>from 10:00, November 21</u>).
- The circulating seawater decontamination system was suspended for maintenance (<u>from 10:01, November 19</u>).
- The decontaminated accumulated water of Units 5 and 6 was sprayed on the premises (from 09:00 to <u>10:50</u>, <u>November 18</u>, from 08:28 to <u>10:42</u>, <u>November 19</u>, and from 09:15 to 10:30, <u>November 21</u>).
- The treated water pressure high alarm went off at one system of the desalination device (a reverse osmosis membrane type) 2, and the high pressure pump and the booster pump inside the device shut off. While the processing at the system was suspended as a result (at 22:47, November 18), another system of the desalination device 2 continues operating.
- Due to the power supply switching work associated with the replacement of the oil cooler at mobile (in-vehicle) transformer B system of the Okuma Line No. 3 where an oil leakage had been identified,
  - The evaporation concentration device was suspended (from 05:00, November 21).
  - The desalination device (a reverse osmosis membrane type) was suspended (from 05:07, November 21).
  - The cesium adsorption device was suspended (from 08:25, November 21).
  - The second cesium adsorption device was suspended (from 08:26, November 21).

#### <Instructions on Food and Drink>

- Addition of suspension on shipment

On November 18, shiitake produced in Nagareyama City, Chiba Prefecture (limited to those grown on raw lumber at the open-field)

#### <Temporary Access to Restricted Areas>

- Residents were allowed temporary access in the following cities and towns:

2) Second round

Tomioka Town (on November 19, by private car) Minamisoma City (on November 19, by bus) News Release

Extract



November 22, 2011 Nuclear and Industrial Safety Agency

#### Seismic Damage Information (the 301st Release)

(As of 14:00 November 22, 2011)

The Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa Nuclear Power Station (NPS), Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows:

1. Nuclear Power Stations (NPSs)

- Fukushima Dai-ichi NPS (TEPCO)
  - Water leakage was found at the connection of the pressure hose at the suction side of the emergency high-ground reactor water injection pump for Unit 1 (at 16:10, November 18). A pan was placed as a measure to receive the leaking water. Subsequently, the pressure hose was replaced (from 09:30 to 10:20, November 22).
  - The accumulated water in the basement of the turbine building of Unit 6 was transferred to a temporary tank (from 10:00 to <u>16:00</u>, November 21).
  - Due to clean-up work at the seawater pump room of Unit 6,
    - The RHR (A) pump of Unit 6 was suspended and the reactor cooling was suspended (from 06:32 to <u>17:42</u>, November 21, and <u>from 06:43</u>, <u>November 22</u>).
    - The ASW (A) pump of Unit 6 was suspended and the spent fuel pool cooling was suspended (from 06:34 to <u>17:20</u>, November 21, and <u>from</u> <u>06:47</u>, November 22).
  - The circulating seawater decontamination system was suspended for maintenance (from 10:01, November 19 to 09:48, November 21).
  - The decontaminated accumulated water of Units 5 and 6 was sprayed on the premises (from 09:04 to 10:50, November 22).
  - Due to the power supply switching work associated with the replacement of the oil cooler at mobile (in-vehicle) transformer B system of the Okuma Line No. 3 where an oil leakage had been identified,

- The evaporation concentration device was suspended (from 05:00 to 23:50, November 21).
- The desalination device (a reverse osmosis membrane type) was suspended (from 05:07 to <u>17:18</u>, November 21).
- The cesium adsorption device was suspended (from 08:25 to <u>16:56</u>, November 21).
- The second cesium adsorption device was suspended (from 08:26 to <u>17:40</u>, November 21).

<Temporary Access to Restricted Areas>

- Residents were allowed temporary access in the following town:
- 2) Second round (by private car)

Okuma Town (on November 22)

For more information: NISA English Home Page http://www.nisa.meti.go.jp/english/index.html

## Summary of Progress Status of "Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station, TEPCO"

#### Basic policy (no change)

By bringing the reactors and the spent fuel pools to a stable cooling condition and mitigating the release of radioactive materials, we will make every effort to enable evacuees to return to their homes and for all citizens to be able to secure a sound life.

#### 2. Targets and achievement date, etc.

[Step 2: Release of radioactive materials is under control and radiation doses are being significantly held down]

- Aim to achieve within this year. As for [Issue (2) Spent fuel pools], [Issue (3) Accumulated water], [Issue (4) Groundwater], [Issue (5) Atmosphere/Soil], [Issue (6) Measurement, Reduction and Disclosure] and [Issue (7) Tsunami, Reinforcement, etc.], the Step 2 targets have already been achieved.
- While keeping the total volume of accumulated water to a level that is able to withstand heavy rains and long-term processing facility outages, the circulating water cooling has been ongoing.
- RPV bottom temperature was 37 °C for Unit 1, 69 °C for Unit 2 and 69 °C for Unit 3 (as of Nov. 16), having stabilized below 100 °C.
- The temperature inside the PCVs was 39 °C for Unit 1, 70 °C for Unit 2 and 59 °C for Unit 3 (as of Nov. 16), having stabilized below 100 °C as well as the RPV bottom temperatures. Hence if damaged fuels have leaked into the PCVs, steam generation would be suppressed due to sufficient cooling, thus the release of radioactive materials from the PCVs has been kept under control.
- The current release rate of radioactive materials (Cesium) from the PCVs is estimated to be approx. 0.06 billion Bg/h. The radiation exposure at the site boundaries due to this release is assessed at 0.1 mSv / year at the maximum that is below the target of 1 mSv / year.
- Under careful evaluation to ensure the adequacy of the mid term security of the circulating water cooling system. Step 2 will be accomplished after confirming the reach of a "cold shutdown condition".



[Issue (4) Groundwater]: Began the water shielding wall construction, and achieved this Step 2 target

• Began construction work of the water shielding wall (Oct. 28). Geological investigations such as land survey or boring are underway.

[Issue (5) Atmosphere/Soil]: Completed the Unit 1 reactor building cover, and achieved this Step 2 target

- The Unit 1 reactor building cover has been completed (Oct. 28).
- Debris removal at the upper part of Units 3 and 4 has been ongoing. •
  - The PCV gas control system in Unit 2 has begun operating (Oct. 28). • Xenon (noble gas) was detected. However, an assessment determined that it was generated due to NOT a critical reaction, but due to spontaneous fission.
  - regulation of the nitrogen gas injection volume.
- Installation work of the PCV gas control system in Units 1 and 3 has begun (Unit 1- Oct. 10, Unit 3- Sep 30).

[Issue (6) Measurement, Reduction and Disclosure]: Estimated the amount of radioactive materials currently being released from the PCVs

- Estimated the current release rate (Cesium) from the PCVs of Units 1-3 based on the airborne radioactivity concentration (dust concentration) at the upper parts of the reactor buildings, etc. • The current total release rate from Units 1-3 based on the assessment this time is estimated to be
  - the accident.
  - The radiation exposure per year at the site boundaries is assessed at approx. 0.1 mSv / year at the effect of the radioactive materials already released up until now).
- Detailed monitoring has begun at the area where the government shall implement decontamination • based on the "Act on Special Measures concerning the Handling of Environment Pollution by Radioactive Materials" (Nov. 7).
- "Decontamination model project at the Restricted Area or the Deliberate Evacuation Area, etc." has ۲ begun (Nov. 8).
- Basic Policy based on "Act on Special Measures concerning the Handling of Environment Pollution by Radioactive Materials" was decided in cabinet (Nov. 11).

[Action plan for mid and long-term issues] Directed to formulate mid and long-term roadmap NISA released the ""the concept of securing the mid-term safety" (Oct. 3.)

- - TEPCO reported on the operating plan as well as the safety assessment results regarding the in a rapid manner.
  - NISA is carefully reviewing that the mid-term safety is secured.
- Mr. Edano, The Minister of Economy, Trade and Industry, together with Mr. Hosono, The Minister for the Restoration from and Prevention of Nuclear Accident, directed TEPCO, ANRE and NISA to formulate "the mid and long-term roadmap towards the decommissioning of Units 1-4 at TEPCO's Fukushima Daiichi Nuclear Power Station" (Nov.9).

Appendix 1

November 17, 2011 Nuclear Emergency Response Headquarters Government-TEPCO Integrated Response Office

• The concentration of hydrogen gas in the PCV is also being monitored, and being controlled via the

approx. 0.06 billion Bg/h at the maximum, which is 1/13,000,000 of the release rate at the time of

maximum based on the aforementioned release rate (The target is 1 mSv / year, excluding the

circulating water cooling system (Oct. 17, Nov. 9). Other systems, etc. shall be reported on as well

"Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station, TEPCO"

November 17<sup>th</sup>, 2011 Nuclear Emergency Response Headquarters Government-TEPCO Integrated Response Office

I. Cooling 1	-
(1) Reactor 1	-
1. Target for Step 2 "Cold Shutdown Condition" 1	-
2. Current status and work implemented 1	-
${ m (I)}$ Water injection has been ongoing towards the achieving "cold shutdown conditions.	"
[Countermeasures 12, 14, 45] 1	-
② Installation of centralized monitoring system in the Main Anti-Earthquake Building	g
(2) Sport Fuel Deel	-
1 Target for Step 2 "More stable cooling" [Achieved]	-
2 Current status and work implemented	-
2. Current status and work implemented	-
Current status of Sperit Fuel Pool     Sperit Fuel     Sperit	-
Desaination of the water in Sperit Fuel Pool [Countermeasures 25, 27]	-
11. Miligation	-
(3) Accumulated water	-
1. Target for Step 2 Reducing the total amount of accumulated water [Achieved]	-
2. Current status and work implemented	-
Status of the accumulated water processing	-
	y
Completed suggesting decelling processing facility (Countermodeurs 12)	-
Storage/management of aludes waste sta [Countermassure 24]	-
Storage/management of sludge waste, etc. [Countermeasure 81]	-
Securing storage [Countermeasure 42]	-
B Prevent contamination in the ocean [Countermeasure 64]	-
(4) Groundwater	-
1. Target for Step 2 Mitigating contamination in the ocean [Achieved]	-
2. Current status and work implemented	-
UConsideration of water shielding wall [Countermeasure 68]	-
2) Implementation of prevention against expansion of contamination in groundwate	٢
[Countermeasure 67]	-
(5) Atmosphere/Soil	-
1. Target for Step 2 "Mitigating dispersion of radioactive materials" [Achieved]	-
2. Current status and work implemented	-
①Installation work for Unit 1 reactor building cover [Countermeasures 54, 55]	-
(2) Removal of debris at the upper part of the reactor buildings (Units 3 and 4	)
[Countermeasure 84] 10	-
(3) Removal and management of debris [Countermeasures 53, 84, 87]	-
(4) Installation of PCV gas control system [Countermeasure 86]	-

III. Monitoring and decontamination	15 -
(6) Measurement, reduction, disclosure	15 -
1. Target for Step 2 "Sufficient reduction of radiation dose" [Achieved]	15 -
2. Current status and work implemented	15 -
$\oplus$ Evaluated the amount of radioactive materials currently released from I	PCV
[Countermeasures 60, 61]	15 -
2 Joint monitoring by the central government, prefectures, municipalities and TEF	٥٥
[Countermeasure 62]	18 -
③ Consideration and commencement of full-scale decontamination [Countermeasure 63	]
20 -	
IV. Countermeasures against aftershocks, etc	22 -
(7) Tsunami and reinforcement, etc	22 -
1. Target for Step 2 "Mitigation of further disasters" [Achieved]	22 -
2. Current status and work implemented	22 -
Implementation of seismic resistance evaluation for each unit [Countermeasure 71]	22 -
V. Environment improvement	24 -
(8) Living/ working environment	24 -
1. Target for Step 2 "Enhancement of Environment Improvement"	24 -
2. Current status and work implemented	24 -
① Expansion status of temporary dormitories [Countermeasure 75]	24 -
② Establishment status of on-site rest stations [Countermeasure 75]	24 -
(9) Radiation control/ medical care	25 -
1. Target for Step 2 "Enhancement of Healthcare"	25 -
2. Current status and work implemented	25 -
Expansion of whole body counters (WBC) [Countermeasure 78]	25 -
② Management of exposure dose, etc. [Countermeasure 78]	25 -
③ Consideration for long-term healthcare such as establishing a database [Countermea	sure
78]- 25 -	
④ Continuous reinforcement of medical system [Countermeasure 80]	25 -
(10) Staff training/personnel allocation	27 -
1. Target for Step 2 "Systematic staff training and personnel allocation"	27 -
2. Current status and work implemented	27 -
$\odot$ Promote staff training, etc. in conjunction with the government and TEF	٥٥
[Countermeasure 85]	27 -
② Stable secure of staff	27 -
VI. Action plan for mid-term issues	29 -
1. Target for Step 2	29 -
2. Current status and work implemented	29 -
① NISA instructed TEPCO to comply with "the concept of securing the mid-term safety"-	29 -

2 TEPCO shall report to NISA in accordance with the instructions 30 -
③ Direction to TEPCO, ANRE and NISA from Mr. Hosono, The Minister for the Restoration
from and Prevention of Nuclear Accidents, and Mr. Edano, The Minister of Economy, Trade
and Industry (Nov. 9) 30 -

# I. Cooling (1) Reactor

1. Target for Step 2 "Cold Shutdown Condition"

- Circulating water cooling will be continued and enforced, thus bringing the reactors to a "Cold Shutdown Condition" monitoring the RPV temperatures, etc.
- Maintain stable operation of accumulated water processing facility (Implementation items are stated in II. (3).)
- NISA to continue confirming operating status and related matters.

Definition of "Cold Shutdown Condition"

- Temperature of RPV bottom is, in general, below 100°C.
- Release of radioactive materials from PCV is under control and public radiation exposure by additional release is being significantly held down. (Not exceed 1 mSv/y at the site boundary as a target.)

In order to keep satisfying the above two conditions, secure mid-term safety of the circulating water cooling system (reliability of parts and materials, redundancy and independency, assessment of time allowance for emergency, detection of failure and trouble, confirmation of restoration measures and recovery time, etc.)

## 2. Current status and work implemented

- ① Water injection has been ongoing towards the achieving "cold shutdown conditions." [Countermeasures 12, 14, 45]
  - RPV bottom temperature was 38°C for Unit 1, 70°C for Unit 2 and 69°C for Unit 3 (as of Nov. 15.), having stabilized below 100°C.
  - Currently, water injection is being implemented at the volume of approx. 7.7 m<sup>3</sup>/h for Unit 1, approx. 10.1 m<sup>3</sup>/h for Unit 2\* and approx. 10.8 m<sup>3</sup>/h for Unit 3\* (as of Nov. 15.)

\*Injecting water via Feed Water line and Core Spray line



- Because it is difficult to decide where damaged fuels are located exactly in each RPV and/or PCV, we need to confirm cooling status of the damaged fuels for their possible leakage into PCV.
- We measure temperatures at many points from lower to upper points in every PCV, and the temperature in each PCV was 40°C for Unit 1, 70°C for Unit 2 and 59°C for Unit 3 (as of Nov.15), having stabilized below 100°C in the same way of RPV bottom temperatures.
- We can also see the same tendency at other measuring points. Hence if damaged fuels have leaked into the PCVs, steam generation would be suppressed due to sufficient cooling, thus the release of radioactive materials from the PCVs has been kept under control.



② Installation of centralized monitoring system in the Main Anti-Earthquake Building [Countermeasures 12,14,45]

- Installed a system that enables the monitoring of various parameters such as the water injection volume, injection pressure, buffer tank water level, operation status of accumulated water treatment system, etc., from monitors installed in the Main Anti-Earthquake Building (Sep. 30.)
- That enables monitoring at the place with minimum radiation exposure in the Main Anti-Earthquake Building.
- Besides, the condition which enables accurate and prompt comprehension of the operation status of equipments was established.

# (2) Spent Fuel Pool

- 1. Target for Step 2 "More stable cooling" [Achieved]
  - "More stable cooling" (target for Step 2) for Units 2 and 3 was achieved by the end of Step 1 by having installed heat exchangers and maintaining pool water level.
  - Circulating cooling systems for Units 1 and 4 have been installed, thus the target for Step 2 has been achieved in all Units (Aug. 10.)

## 2. Current status and work implemented

- ① Current status of Spent Fuel Pool
  - Unit 1: 21°C, Unit 2: 23°C, Unit 3: 22°C and Unit 4: 31°C (as of Nov. 15)
- 2 Desalination of the water in Spent Fuel Pool [Countermeasures 25, 27]
  - In order to prevent corrosion of the spent fuel pool, the desalination facility has begun operation in Unit 4 (Aug. 20.)
  - The salt concentration of water (chloride ion concentration) in the spent fuel pool in Unit 4 before the operation of the desalination facility was 1,944 ppm (Aug. 20), while its concentration after the operation was 150 ppm (Nov. 5.)
  - The desalination for Unit 2 is now being prepared.
  - The desalination for Unit 3, in which sea water injections were carried out, is planned to be implemented in turn.



# II. Mitigation

# (3) Accumulated Water

## 1. Target for Step 2 "Reducing the total amount of accumulated water"

[Achieved]

- Reduction of the total amount of accumulated water by processing the accumulated water in the buildings via the stable operation of processing facility.
- Augmentation of reuse by expansion of high-level contaminated water processing facility, steady operation and desalination of decontaminated water.
- Begin consideration of full-scale water processing facilities for high-level contaminated water.
- Storage/management of sludge waste generated from high-level contaminated water processing facility.
- Implemented steel pipe sheet pile installation work at the port to mitigate contamination in the ocean.

## 2. Current status and work implemented

## ① Status of the accumulated water processing

- Regarding accumulated water processing performance, approx. 161,580 tons have been processed in total (as of Nov. 14.)
- The accumulated water level is being kept at the present target level (O.P 3,000.) In other words, the total amount of accumulated water is at the level where it is able to withstand heavy rains as well as long-term processing facility outages. Accumulated water in the Unit 1 turbine building was transferred into the Unit 2, thus the water level fell.
- Decontamination factor\* of the processing facility for cesium is 10<sup>6</sup> in the apparatus of Kurion-Areva (as of Aug.9), 10<sup>4</sup> in Kurion (as of Nov.1) and 10<sup>5</sup> in SARRY (as of Nov.1.)

\* Decontamination factor=cesium concentration of a sample before processing / cesium concentration of a sample after processing

## ② Implemented reliability enhancement countermeasures towards

## stable processing [Countermeasure 43]

Installed cesium adsorption apparatus (SARRY) and completed the augmentation of decontamination facility (Aug.18.)

## ③ Completed augmenting desalination processing facility [Countermeasure 43]

 Installed the evaporative concentration apparatus (two lines, Aug.7 and 31) in addition to the reverse osmosis membrane method (Jun.17.)

- Ascertained that chlorine concentration had been decreased from 3,000 ppm to approx. 3ppm by the reverse osmosis equipment (per the Nov.1 results) and that had been decreased from 9,000 ppm to approx. 2 ppm by the evaporative concentration apparatus (per the Nov. 1 results.)
- Completed augmentation of desalination processing facility via the evaporative concentration apparatus (Oct.9.)



## **④** Storage/management of sludge waste, etc. [Countermeasure 81]

- Sludge waste with high radioactive concentration generated by processing the high-level contaminated water and high radioactive used-adsorption tower are properly being secured and managed respectively in the Centralized Waste Processing Building and the adsorption tower storage facility.
- Implementing installation work for sludge waste storage facility in order to expand storage capacity.
- Implementing installation work for used-adsorption tower storage facility in order to expand storage capacity.

#### **(5)** Securing storage [Countermeasure 42]

 Installed tanks for high-level contaminated water (2,800 tons) in order to expand storage facility (Sep.17.)

## **(6)** Prevent contamination in the ocean [Countermeasure 64]

- Completed the placement of the steel pipe sheet pile in order to block the damaged parts of permeation prevention structure due to the tsunami at the south side of the intake canal of Units 1 to 4 as a countermeasure to mitigate contamination in the ocean (Sep.28.)



# (4) Groundwater

- 1. Target for Step 2 "Mitigating contamination in the ocean" [Achieved]
  - Mitigate contamination in groundwater as well as contamination in the ocean via groundwater by controlling accumulated water inflow into groundwater.
  - Commencing installation work for water shielding wall in front of existing seawalls of Units 1 to 4, with the expectation of mitigating contamination in the ocean via groundwater.

## 2. Current status and work implemented

①Consideration of water shielding wall [Countermeasure 68]

- In order to further ensure the mitigatation of contamination in the ocean via groundwater, installaton of the water-proof steel pipe sheet piles in front of the existing seawalls of Units 1 to 4 started (Oct. 28.) Geological investigations such as land surveys or boring are underway.
- After a comprehensive consideration of the effects or impacts of the shielding wall installation on the land side, it has been concluded that installation only on the ocean side should be appropriate at the present time.



②Implementation of prevention against expansion of contamination in groundwater [Countermeasure 67]

 Installed pumps at sub-drainage pit on the turbine building side at seven places (Jul. 29.)

# (5) Atmosphere/Soil

1. Target for Step 2 "Mitigating dispersion of radioactive materials"

[Achieved]

- Reduce dispersion of radioactive materials deposited in the site.
- Continue dust inhibitor spraying as well as removal of debris.
- Install the reactor building cover (Unit 1.)
- Commence removal of debris on top of the reactor buildings (Units 3 and 4.)
- Consider containers for the reactor buildings.
- 2. Current status and work implemented

①Installation work for Unit 1 reactor building cover [Countermeasures

54, 55]

- Installed auxiliary equipment such as exhaust systems.
- Completed the installation of the Unit 1 reactor building cover (Oct.28.)

![](_page_27_Picture_13.jpeg)

Removal of debris at the upper part of the reactor buildings (Units 3 and 4) [Countermeasure 84]

• Removing debris at the upper part of the reactor buildings of Units 3 and 4.

![](_page_28_Picture_0.jpeg)

③ Removal and management of debris [Countermeasures 53, 84, 87]

<Removal of debris>

- Approx. 28,000m<sup>3</sup> debris have been removed, out of which 6,000m<sup>3</sup> are stored in approx. 900 containers (as of Nov. 17) [Countermeasures 53, 84].
- The waste such as the removed debris or the trees cut down for site preparation are classified according to their kinds as well as the amount of radiation dose in the storage area and then will be transported.

<Management of debris>

- Debris are stored in the containers and reserved in the buildings according to the amount of radiation dose.
- The approach lane to the waste storage area is marked off and a No Entry sign was posted to prevent entrance of unauthorized personnel.
- Except for the radioactive accumulated water treatment facilities and the other areas under construction, the storage areas are secured, fully utilizing the land within the site.

![](_page_28_Picture_9.jpeg)

<Water spray in the site>

• Purified water, which satisfies the guideline for bathing water, is reused to spray in the site in order to prevent lumber from firing spontaneously and dust from dispersing.

Result of the purified water analysis and guideline for bathing water (Unit : Bq/cm <sup>3</sup> )						
Nuclide	Result of purified water analysis (( ):detection limit)	Guideline for radioactive materials in bathing water (Ministry of the Environment)	<reference> WHO basis</reference>			
lodine131	ND(<9.0×10 <sup>-4</sup> )	3.0×10 <sup>-2</sup>	1.0×10 <sup>-2</sup>			
Cesium134	ND(<1.3×10 <sup>-3</sup> )	5.0×10 <sup>-2</sup>	1.0×10 <sup>-2</sup>			
Cesium137	ND(<1.4×10 <sup>-3</sup> )         (Sum of Cesium 134 & 137)		1.0×10 <sup>-2</sup>			
<reference></reference>						
Tritium	2.6×10 <sup>0</sup>		1.0×10 <sup>+1</sup>			
Strontium 89	ND(<8.4×10 <sup>-5</sup> )		1.0×10 <sup>-1</sup>			
Strontium 90	ND(<4.8×10 <sup>-5</sup> )		1.0×10 <sup>-2</sup>			

(4) Installation of PCV gas control system [Countermeasure 86]

- The PCV gas control system started its operation at Unit 2 (Oct.28.)
- Installation work started at Units 1 and 3 (Unit 1- Oct 10, Unit 3- Sep.30.)
- Careful measures are taken such as nitrogen injection and adoption of static electricity resistant hose since highly concentrated hydrogen was detected in the piping arrangement on which are to be worked.

#### Conceptual Diagram of PCV Gas Control System

- A system to adjust the pressure in the PCV to the almost same level as the atmospheric pressure by extracting almost the same amount of gas as the nitrogen fill ration in the PCV in order to reduce the amount of radioactive materials released from PCV after the temperature at the bottom of the reactor is kept below 100°C.
- The extracted gas shall be released after being monitored in addition to being cleared of the radioactive materials via filters.
- The amount of radioactive materials released from PCV will be further reduced using the system, while it is expected to reduce due to the decline in the temperature of the reactor.

![](_page_30_Figure_4.jpeg)

#### Image for PCV Gas Control System, Unit 2

- Xenon (noble gas) was detected in the PCV gas control system of Unit 2, however, an assessment determined that it was generated due to NOT a critical reaction, but due to spontaneous fission. Facilities which inject boric acid water to stop a critical reaction were installed at Unit 1 to 3 for a possible critical reaction.
- Xenon might be in PCVs of Unit 1 to 3, because there are some nuclides such as Curium, which are contained in usual spent fuels, bring spontaneous fission in each PCV.

- The hydrogen concentration in the PCV has been also monitored (1.3%, as of Nov. 14) and controlled below the lower flammability limit concentration (4%)\* by adjusting nitrogen injection rate. Nitrogen injection rate is also adjusted at Unit 1 and 3, because hydrogen is generated by water radiolysis.
- \* Lower flammability limit 4%: The lowest concentration of hydrogen in Oxygen above 5% by volume capable of producing a flash of fire in presence of an ignition source.

# III. Monitoring and decontamination

## (6) Measurement, reduction, disclosure

1. Target for Step 2 "Sufficient reduction of radiation dose" [Achieved]

- Expansion and enhancement of monitoring, and continuation of disclosure.
- Monitoring by government, prefectures, municipalities and TEPCO.
- Commencement of full-scale decontamination.
- 2. Current status and work implemented

DEvaluated the amount of radioactive materials currently released from

PCV [Countermeasures 60, 61]

 In order to estimate the individual current release rate from the PCV of Units 1 to 3, implemented the measurement of the airborne radioactivity concentration at the upper part of the reactor buildings etc.

![](_page_32_Figure_10.jpeg)

- Evaluated the current release rate for Cesium from PCV of Units 1 to 3 utilizing the airborne radioactivity concentration (dust concentration) at the upper parts of the reactor buildings etc.
- The current release rate for each Unit is estimated at, Unit 1: approx. 0.01 billion Bq/h, Unit 2: approx. 0.01 billion Bq/h and Unit 3: approx. 0.04 billion Bq/h, respectively, using dust concentration at the upper parts of the reactor buildings.
- The current total release rate from Units 1-3 based on the assessment this time is estimated to be approx. 0.06 billion Bq/h at the maximum, which is 1/13,000,000 of the release rate at the time of the accident.
- For reference, evaluated the current release rate for Cesium from PCV of Units 1-3 utilizing the airborne radioactivity concentration (dust concentration) at sea. The result was approx. 0.02 billion Bq/h (The previous version: 0.07 billion Bq/h.)

Release rates of radioactive materials (Cesium) per hour from Units 1 to 3

![](_page_33_Figure_5.jpeg)

The radiation exposure per year at the site boundaries is assessed at approx.
 0.1 mSv / year at the maximum based on the aforementioned release rate (The target is 1 mSv / year, excluding the effect of the radioactive materials already released up until now.)

![](_page_34_Figure_1.jpeg)

The current release rate of noble gas is estimated at approx. 14 billion Bq/h based on the data monitored by the PCV gas control system at Unit 2 (those of Units 1 and 3 are also estimated at the same rate of Unit 2.) The exposure dose based on the aforementioned release rate is assessed at 0.00012 mSv/y (those of Units 1 and 3 are also estimated at the same rate of Unit 2.) This rate is extremely lower than the exposure dose based on the release rate of Cesium, thus we utilize Cesium release rate as the main release rate.

② Joint monitoring by the central government, prefectures, municipalities and TEPCO [Countermeasure 62]

• Having instructions from the Ministry of Education, Culture, Sports, Science and Technology, TEPCO implemented sampling and measurement at land and sea as below.

[Land]

- <Monitoring within 20km radius>
- Measurement of airborne radioactivity concentration by the support team from other electricity utility companies at 50 points (once a week.)
- Dust sampling at 5 points around 10 km radius by the same team (once a month.)

[Sea]

<fukushima prefecture=""></fukushima>	<lbaraki prefecture=""></lbaraki>	<mivagi prefecture=""></mivagi>
Seawater at 11 points within the	Seawater at 5 points	Seawater at 6 points
site bay (once a day)	(once a week)	(twice a month)
Seawater at 4 points along the		
coast (once a day)		
Seawater at 8 points within		
20km radius (every two days)		
Seawater at 3 points within		
30km radius (once a week)		
Seawater at 10 points outside		
30km radius (once a week)		
Seabed soil survey at 25 points		
(once a month)		

- Sampling of seawater and seabed soil at a few kilometers offshore in front of the power station will be implemented with an unmanned survey boat.
- The Cabinet Office and the Ministry of Education, Culture, Sports, Science and Technology announced the implementation of "Wide Area Monitoring" at restricted areas and deliberate evacuation areas (Sep. 1.)

![](_page_36_Figure_0.jpeg)

 TEPCO joined in developing the "Wide Area Monitoring" plan and conducting monitoring (approx. 800 persons in total.)

![](_page_36_Picture_2.jpeg)

- Based on the result of Wide Area Monitoring, the "Detailed Monitoring" on houses, roads and school grounds was being implemented in order to collect basic data for the development of implementation plan to improve the environment of these areas (mid-June – end of October.)
- Through the Wide Area Monitoring and the Detailed Monitoring currently in progress, TEPCO has collected information that would contribute to the effective decontamination work.

- TEPCO also started to support detailed monitoring in the area where the government will implement decontamination (Nov. 7).
- The Ministry of Education, Culture, Sports, Science and Technology published "Map of radioactive contamination (Cesium contamination map)" (Aug. 30.) After that, contamination maps of Iodine-131, Plutonium 238, 239+240, Strontium 89 & 90, Tellurium 129m and Silver 110m were sequentially published.

![](_page_37_Figure_2.jpeg)

- Measurement of airborne radioactivity concentration and soil sampling were conducted by universities, Japan Atomic Energy Agency, National Institute of Radiological Sciences, Japan Chemical Analysis Center and the support team from other electricity utility companies etc.
- ③ Consideration and commencement of full-scale decontamination [Countermeasure 63]

[Countermeasures implemented by the central government]

- The central government published "A work schedule for development of the interim storage facility (roadmap)" targeting transfer to the interim storage facility three years after full-scale transfer to the temporary storage yard per "The basic concept of the interim storage facility required in dealing with environmental contamination due to radioactive materials resulting from the accident at Fukushima Daiichi Nuclear Power Plant, TEPCO" (Oct. 29.)
- The central government began detailed monitoring in regions where the central government shall implement decontamination per the Act on Special Measures concerning the Handling of Environment Pollution by Radioactive Materials (Nov. 7.)

- Utilizing the Great East Japan Earthquake Recovery and Reconstruction Reserve Fund, in order to lower annual exposure dose at 12 municipalities designated as restricted areas and deliberate evacuation areas, the central government began the "Decontamination model project at the restricted areas and the deliberate evacuation areas, etc." (Nov. 8.)
- Cabinet approved the basic policy per the Act on Special Measures concerning the Handling of Environment Pollution by Radioactive Materials (Nov .11.)

[Activities where TEPCO is participating]

- With the knowledge about the radioactivity management, work management etc., TEPCO will support JAEA, trustee of the decontamination model project conducted by the central government at the restricted area etc.
- In order to support the development of municipal decontamination plan, TEPCO started personnel support for the government's expert allocation program (Oct. 3).TEPCO provided Fukushima Prefecture with personnel support for the model project to reduce radiation at general residential areas (Aug. 25 and 26.)
- TEPCO employees join the decontamination work implemented by municipalities in Fukushima Prefecture and they support pre-monitoring and decontamination work.

# IV. Countermeasures against aftershocks, etc.(7) Tsunami and reinforcement, etc.

1. Target for Step 2 "Mitigation of further disasters" [Achieved]

- Prevent situation from deterioration by mitigating disasters with countermeasures against emergencies (earthquakes and tsunami, etc.)
- Consideration of reinforcement work of each unit as necessary.
- Continue implementing various radiation shielding measures.

## 2. Current status and work implemented

① Implementation of seismic resistance evaluation for each unit

[Countermeasure 71]

- Consideration of current seismic resistance and reinforcement, etc. for reactor buildings of Unit 2, Unit 5 and Unit 6 was implemented and evaluated by Aug. 26 (Unit 1 and Unit 4 were completed by May 28 and Unit 3 was completed by Jul. 13.)
- As a result of the analysis, it was evaluated that seismic resistance can be secured without any reinforcement.

![](_page_39_Figure_10.jpeg)

In adition to the aforementioned • evaluation, visual inspections have been implemented for pipe support structures of the Reactor Feed Water System, which were evaluated as especially weakest points. As a result, it has been acertained that all support structures ramain sound status.

![](_page_40_Picture_1.jpeg)

# V. Environment improvement

# (8) Living/ working environment

- 1. Target for Step 2 "Enhancement of Environment Improvement"
  - Improve workers' living/working environment that had been harsh during the initial phase of the accident, thus leading to maintaining workers' motivation.
  - Expansion of temporary dormitories and on-site rest stations.
  - Improvement of environment such as meals, bath, laundry, etc.
- 2. Current status and work implemented
  - ① Expansion status of temporary dormitories [Countermeasure 75]
    - Completed construction of temporary dormitory able to accommodate 1,600 persons (Aug. 31). Approx. 1,200 persons have already moved in (as of Nov. 1.)
  - 2 Establishment status of on-site rest stations [Countermeasure 75]
    - Twenty on-site rest stations have been established (approx. 4,750m<sup>2</sup> in size with a capacity to accommodate approx. 1,600 persons) (as of Nov. 1.)

![](_page_41_Picture_11.jpeg)

Inside of on-site rest stations (from left: drinking water, etc., restroom and air shower)

![](_page_41_Picture_13.jpeg)

# (9) Radiation control/ medical care

- 1. Target for Step 2 "Enhancement of Healthcare"
  - Thorough radiation exposure control and countermeasures against heat stroke and influenza
  - Reinforcement of radiation control by NISA
  - Increase in the number of whole body counters, monthly measurement of internal exposure.
  - Automated recording of personal radiation dose, report of personal exposure dose in writing, introduction of workers' certificates with photos.
  - Consideration of a long-term healthcare such as enhancement of workers' safety training and establishment of a database.

#### 2. Current status and work implemented

- ① Expansion of whole body counters (WBC) [Countermeasure 78]
  - Increased WBCs as planned (12 units have already been added as of Oct. 3).
  - Started measuring internal exposure once a month from September.

#### 2 Management of exposure dose, etc. [Countermeasure 78]

- Distribution of personal exposure recording format in every entry (Aug. 16), Introduction of workers' certificates with photos step by step (Jul. 29), Currently preparing for automated recording of personal exposure (Exposure data are currently manually input for the future use.)
- The upper limit of exposure dose for workers newly appointed for emergency work after Nov.1 was lowered to 100mSv/y, except for emergency operation to deal with such as loss of reactor cooling function in the area with the possibility of over 0.1mSv/h in or around the reactor facilities, etc. (Nov. 1.)
- Airborne radioactivity concentration at the site has been kept below the standard of wearing full-face mask since mid-June stably. We have begun to allow workers to work without wearing a full-face mask (half-faced mask) in the limited area in order to reduce worker's burden (from Nov. 8).
- ③ Consideration for long-term healthcare such as establishing a

#### database [Countermeasure 78]

- Announced the report of expert committee on the database creation and long-term health management (Sep. 26.)
- Obligate TEPCO to submit exposure dose records and health check records for long-term health management by revision of the Ordinance on Prevention of lonizing Radiation Hazards, and announced a guideline regarding implementation of examination, etc. according to exposure dose (Oct. 11.)

Continuous reinforcement of medical system [Countermeasure 80]

· Continuous assignment of medical specialists from emergency department,

nurses and radiation specialists to the Unit 5/6's emergency medical room.

- Reinforcement of medical facility and decontamination facility to enable the speedy transportation of patients and also the direct transportation of non-contaminated severely ill or injured patients to hospitals (prepared three transportation vehicles including ambulance.)
- Implementation of prevention and mitigation countermeasures against influenza (Nov. 1.)
- Check of recent health condition and medical history of new site workers (from Oct. 24.) Continuous assignment of medical specialists from emergency department, etc. to the Unit 5/6's emergency medical room after September, with making the emergency room to be the regular facility, which was planned to be opened only during this summer.

![](_page_43_Picture_4.jpeg)

# (10) Staff training/personnel allocation

- 1. Target for Step 2 "Systematic staff training and personnel allocation"
  - Promotion of staff training in conjunction with the Government and TEPCO

## 2. Current status and work implemented

- Promote staff training, etc. in conjunction with the government and TEPCO [Countermeasure 85]
  - Conducting training for staffs engaged in radiation related work, who will be in great demand.
  - TEPCO has been conducting "radiation survey staff training" targeted for employees and TEPCO group companies' employees and has already trained approx. 3,700 personnel.
  - The government has been conducting "radiation survey staff training" (7 times till Oct. 7 and approx. 200 personnel were trained.), "radiation protection staff training" (approx. 10 personnel were trained from Aug. 8 to 12, approx. 30 personnel were trained from Sep. 26 to 30) and will continue these trainings.
  - According to affiliated companies needs, launched a new framework of looking for workers widely through Japan Atomic Industrial Forum (JAIF.)

![](_page_44_Figure_9.jpeg)

### ② Stable secure of staff

- Since this October, TEPCO has made some reshuffles of 50 employees who have high radiation exposure dose.
- TEPCO has implemented a survey concerning the improvement of working environment in terms of securing staff stably. Based on the results of this survey, TEPCO has implemented some improvements (reduction of full-face

mask area, expeditious survey by utilizing a gate monitor, expansion of parking area at J-village, etc.)

• Developing measures to reduce exposure dose in the main anti-earthquake building.

# VI. Action plan for mid-term issues

- 1. Target for Step 2
  - Development of "the concept of securing the mid-term safety" by the government.
  - Development of plant operation plans by TEPCO based on the above policy.
- 2. Current status and work implemented
  - ① NISA instructed TEPCO to comply with "the concept of securing the mid-term safety"
    - NISA disclosed (on Oct. 3) "the concept of securing the mid-term safety" concerning Units 1 to 4 of Fukushima Daiichi Nuclear Power Station of TEPCO" in order to secure safety during the period (mid-term: within approx. 3 years) which starts from completion of Step 2 and ends before starting the work for decommissioning the reactors".
    - \*In order to manage additional emission of radioactive materials from the nuclear reactor facilities and to restrain radiation dose, it requires the following four (4) items and also requires setting basic targets and necessary conditions for safety.
      - To identify emission sources of radioactive materials, implement adequate restrain measures and monitor them (Emission restraining and managing functions)
      - To adequately remove the decay heat of the reactor pressure vessels, the primary containment vessels and the spent fuel pools (Cooling function)
      - To prevent criticality in the reactor pressure vessels, the primary containment vessels and the spent fuel pools (Criticality preventing function)
      - To detect, adequately manage and treat flammable gasses (Hydrogen explosion preventing function)

![](_page_46_Figure_12.jpeg)

- **②** TEPCO shall report to NISA in accordance with the instructions
  - TEPCO reported on the operating plan and safety assessment results regarding circulating water cooling system (Oct. 17 and Nov. 9). Other systems, etc. shall be reported on as well in a rapid manner.
  - NISA is carefully reviewing that mid-term safety is secured.

![](_page_47_Picture_3.jpeg)

③ Direction to TEPCO, ANRE and NISA from Mr. Edano, The Minister of Economy, Trade and Industry, and Mr. Hosono, The Minister for

- the Restoration from and Prevention of Nuclear Accidents (Nov. 9)
- To develop a reasonable and specific timeline within the timeframe by the end of decommissioning.
- To develop a R&D plan for restoration from the accident and decommissioning.
- To secure sufficient number of on-site workers from both TEPCO and external source, taking care of improving their working condition.
- To improve reliability of systems such as the circulating water cooling system, and to treat highly concentrated contaminated water accumulated in the buildings in a rapid manner. To develop plans for them.
- To achieve decreasing radiation exposure dose at site boundaries due to newly discharged from the whole of the power station to the level less than 1 mSv/year as soon as possible. To develop plans for that.
- To conduct waste control and decontamination at the site appropriately. To develop plans for that.
- To start removal of spent fuels from the spent fuel pools in the reactor buildings within approx. 2 years. To develop plans for that.
- To set out removal of melted fuels within 10 years. To develop plans for that.

End

### Current Status of "Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station, TEPCO" (Revised edition)

Appendix 3 November 17, 2011 Nuclear Emergency Response Headquarters Government-TEPCO Integrated Response Office

Red colored letter: changed from the previous version, \*: already reported to the government, Green colored shading: achieved target

![](_page_48_Figure_3.jpeg)

### Current Status of "Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station, TEPCO" (Revised edition)

November 17, 2011 Nuclear Emergency Response Headquarters Government-TEPCO Integrated Response Office

Red colored letter: changed from the previous version,  $\bigstar$ : already reported to the government, Green colored shading: achieved target

Issues		As of Apr. 17 Step 1 (around 3 months)		Step 2 (through the end of this year) current status (as of Nov. 17)		Mid-term issues (around 3 years)
III. Monitoring/ Decontamination	( <sup>(C)</sup> ) Measurement, Reduction and Disclosure	Expansion, e	nhancement and disclosure of radiation dose monitorir	ng in and out of the power station	Deconta	Continuous environmental monitoring
				Consideration/start of full-fledged decontamina	mination	Continuous decontamination
IV. Counte against afte	( 〜) Tsunar Reinfor		Enhancement of countermeasures against aftershoo preparation for various countermeasures for radia	cks and tsunami, ation shielding	Mitigate	Continue various countermeasures for radiation shielding
rmeasures rshocks, etc	ni, cement, etc		(Unit 4 spent fuel pool) Installation of supporting structure ☆	Consideration of reinforcement work of each Unit 🖈	disasters	Reinforcement work of each Unit
۷.	(∞) Living/working environmer		Improvement of workers' li	ving / working environment	Enhancement of environment of Improvement	Improvement of workers' living / working environment
Environment	(の) Radiati control / Medical c		Improvement of radia	ation control / medical system	of Enhanceme Healthca	Improvement of radiation control / medical system
improven	on (0) are perso				nt of radi	
nent	Staff Training nnel allocatior			of staff training / personnel allocation	haustive ation dose control	of staff training / personnel allocation
Action plan for mid-and-long- term issues				Concept of mid-term security Establishing plant op plan based on mid-terr Formulating a m long-term road	peration m securit id-and- dmap	y Response based on the plant operation plan

## Overview of Major Countermeasures in the Power Station as of November 17

Underlined: deleted countermeasures, red colored: newly added countermeasures, x: already reported to the government

![](_page_50_Figure_2.jpeg)

# Current Status of Countermeasures (1)

![](_page_51_Figure_2.jpeg)

# Current Status of Countermeasures (2)

![](_page_52_Figure_2.jpeg)

# Current Status of Countermeasures (3)

lssu	ies	<step (through="" 2="" end="" of="" the="" this="" year)="">: Release of radioactive materials is under control and radiation doses are being significantly held down 7 Start of Step 2 (Jul. 17) 7 Current status (as of Nov. 17</step>	7)
( ۳) Accumulated Water II. Mitigation	les (3)	<step (through="" 2="" end="" of="" the="" this="" year)="">: Release of radioactive materials is under control and radiation doses are being significantly held down Start of Step 2 (Jul. 17)   [High level]     Term to keep the amount of accumulated water in the building (Countermeasure 43) *     Elimination, continuous processing and system enhancement of accumulated water in the building (Countermeasure 43) *     Construction of Cesium adsorption facilities (distillation) (term II)     Installation work of desalination facilities (reverse osmosis membrane type) (term I) : Processing start (Jun. 17)   Installation work of desalination facilities (reverse osmosis membrane type) (term I) : Processing start (Jun. 17)</step>	Target [∞] Decrease
	) Accumula	Consideration of full-fledged water processing facilities [Countermeasure 82]         Storage / management of sludge Waste etc. [Countermeasure 81] ★         -Storage and management at existing tanks         Design of additional storage facility	the total an
	ated Water	Secure sufficient storage place [Countermeasures 42]       Expand sufficient storage place [Countermeasures 42]         [Receiver tanks for high radiation level water]       Installation of 2,800t (Sep. 17)         [Receiver tanks for processed water]       33,000t (until Jul. 14)	nount of accurr
		22,000 t (Aug. 13)       23,000 t (Sep. 16)       15,000 t (Oct. 8)       13,000 t (Nov. 15)       Approx. 20,000t/ month         Mitigation of contamination in the ocean [Countermeasure 64]       Circulating decontamination of the seawater         Installation of steel pipe sheet pile (Sep. 28)	ulated water
		[Low level] Continue decontamination [Countermeasures 44,46] Decontamination with decontaminant (zeolite) (May 1)	arted vet

Current Status of Countermeasures (4) Red colored letter: newly added countermeasures, Red frame: progressed Vil countermeasures from the previous version, \*: already reported to the government

lss	ues	Step 2 (through the end of this year)>: Release of radioactive materials is under control and radiation doses is being significantly held down Start of Step 2 (Jul. 17) Current status (as of Nov	. 17)
	(4) Grou	Implementation of preventions against expansion of groundwater contamination [Countermeasure 67] - Restoration of sub-drainage pumps with expansion of storage / processing facilities	Targe Mitigation contam
	undwater	Design of impermeable wall against groundwater [Countermeasure 68] Start establishment of impermeable wall against groundwater [Countermeasure 83] (Oct. 28)	t [4] of ocean ination
.=	(5)	Confirmation of solidification of inhibitor [Countermeasure 52]	
Mitig		Removal / management of debris [Countermeasure 53, 87]         -Collected debris (Volume of approx. 900 containers (as of Nov. 17))         -Management of collected debris etc. in storage areas    Spraying treated water, which meets the guideline in the bathing area, in the NPS to prevent radioactive dust from scattering (Oct. 7)	Farget [
atic	Atm	Installation of reactor building cover (Unit 1) [Countermeasures 54,55] 🖈 - Completed (Oct. 28)	di 10
n	losph	Removal of debris at the upper parts of reactor buildings (Unit 3&4) [Countermeasures 84] - Started debris removal at the upper parts of reactor buildings (Unit3: Sep. 10, Unit4: Sep. 21)	Preve
	lere	Preparation for Unit 3 (Removal of debris on the ground, maintenance of road for crane etc,) Debris removal at the upper part of reactor building	) ma
	S / \$	Preparation for Unit 4 (Removal of debris on the ground, maintenance of road for crane etc,) Debris removal at the upper part of reactor building	teria
	<u>Ö</u> :	Consideration of reactor building container [Countermeasure 50]	als erin
		Installation of PCV gas control system [Countermeasure 86] Unit 1: Started construction (Oct. 10), Unit 2: Completed (Oct. 28), Unit 3: Started construction (Sep. 30)	9
III. Monitoring / Decontami	( ) Measurement, Reductio Disclosure	<ul> <li>Continue to assess current release of radioactive materials from PCVs [Countermeasures 60,61]</li> <li>The current release rates (Cesium) from PCVs of Units 1 to 3 were assessed based on the airborne radioactivity concentration (dust concentration) at the upper parts of the reactor buildings, etc.</li> <li>The current total release rate from Units 1-3 based on the assessment this time is estimated at approx. 0.06 billion Bq/h at the maximum which is 1/13,000,000 of that at the time of the accident.</li> <li>The radiation exposure per year at the site boundaries is assessed at approx. 0.1 mSv / year at the maximum based on the aforementioned release rate (The target is 1 mSv / year. Excluding the effect of the radioactive materials already released up until now).</li> </ul>	Target [꼰] Sufficiently reduc radiation dose
ination	on and	Consideration / start of full-fledged decontamination [Countermeasures 63] - Detailed monitoring has begun at the area where the government shall implement decontamination based on the "Act on Special Measures concerning the Handling of Environment Pollution by Radioactive Materials" (Nov. 7). –"Decontamination model project at the Restricted Area or the Deliberate Evacuation Area, etc." has begun (Nov. 8) - Basic policy based on the "Act on Special Measures concerning the Handling of Environment Pollution by Radioactive Materials" was decided in cabinet(Nov. 11).	ê

Current Status of Countermeasures (5) Red colored letter: newly added countermeasures, Red frame: progressed Viii countermeasures from the previous version, \*: already reported to the government

lss	ues	Step 2 (through the end of this year) Release of radioactive materials is under control and radiation doses are being significantly held dow 7 Start of Step 2 (Jul. 17) Current status (as of Nov. 17)	n	
IV. Countermeasures against aftershocks, etc	(꼰) Tsunami, reinforcement, etc	(Unit 4) Installation of supporting structure under the bottom of the fuel pool [Countermeasure 26] ★       Consideration of reinforcement work of each Unit [Countermeasure 71] - Evaluation of seismic resistance has been completed (Aug.26) ★         Continue various countermeasures for radiation shielding [Countermeasure 73]	Target [岱] Mitigation of disasters	
	(∞) Living / working Environment	Continuation and enhancement of improvement of workers' living / working environment [Countermeasure 75] - Accommodations for approx. 1,600 people have been prepared. Approx. 1,200 people have already moved in (as of Nov. 1) -20 on-site rest stations have been established (approx. 4,750m <sup>2</sup> in size with a capacity to accommodate approx. 1,600 people) (as of Nov. 1)	Enhancement of environment improvement	Tarrat ( 8)
V. Environment improvement	(တ) Radiation control /Medical care	Continuous improvement of radiation control [Countermeasure 78]         - Reinforcement of radiation control by NISA         - Expansion of whole-body counters, implementation of monthly internal exposure measurement ★         - Automated recording of personal radiation dose, written notification of exposure dose ★, introduction of workers' certificates with photos ★         - Consideration of long-term healthcare such as enhancement of safety training for workers and establishing database etc.         Continuous reinforcement of medical system [Countermeasure 80]         - Install new emergency medical facility, establish organization with resident specialists (on call 24 hours a day), speedy transportation of patients         - Intensive preventive measures against heat stroke ★ (trainings for new workers), countermeasures for mental health, conducting medical examination, prevention and mitigation of flu         - Establish industrial hygiene system such as preventive healthcare	Target [짅] Enhancement of healthcare	
	(은) Staff Training / personnel allocation	Systematic staff training and personnel allocation [Countermeasure 85] - Promote human resources training in conjunction with the government and TEPCO	Exhaustive radiation dose control	